

WHAT IS CLAIMED IS:

1. An electron beam inspection system comprising:

an electron optics assembly;

a voltage contrast plate;

5 a multiplicity of secondary electron detectors situated between the electron optics assembly and the voltage contrast plate;

a wafer stage situated below the voltage contrast plate;

a multiplicity of image storage memory devices connected to the multiplicity of secondary electron detectors;

10 a multiplicity of image computers connected to the multiplicity of image storage devices;

a multiplicity of post-processors connected to the multiplicity of image computers;  
and

a display connected to the multiplicity of post-processors.

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2. An electron beam inspection system as in claim 1 wherein the wafer stage has six degrees of freedom of movement.

3. An electron beam inspection system as in claim 1 further comprising a wafer

20 situated on the wafer stage.

4. An electron beam inspection system as in claim 3 wherein the voltage contrast plate has openings which are beveled at an angle so as to produce an electric field free region at the wafer.

5 5. An electron beam inspection system as in claim 1 wherein the electron optics assembly comprises multiple electron beam columns.

6. An electron beam inspection system as in claim 5 wherein each electron beam column comprises:

- 10 an electron gun;  
an accelerating region situated below the electron gun;  
deflectors situated below the accelerating region;  
a blanking aperture situated below the deflectors;  
focus lenses situated below the blanking aperture; and  
15 a field-free tube situated below the focus lenses.

7. An electron beam inspection system as in claim 1 wherein the electron optics assembly is comprised of electrostatic electron optical elements.

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8. An electron beam column comprising:

an electron gun;

an accelerating region situated below the electron gun;

deflectors situated below the accelerating region;

5 a blanking aperture situated below the deflectors;

focus lenses situated below the blanking aperture;

a field-free tube situated below the focus lenses;

a voltage contrast plate situated below the field-free tube; and

10 a secondary electron detector situated between the field-free tube and the voltage contrast plate.

9. An electron beam column as in claim 8 wherein the electron gun comprises:

an array of field emission cathodes; and

15 an array of beam limiting apertures bonded to the array of field emission cathodes.

10. An electron beam column as in claim 9 wherein the array of field emission cathodes are individually operable.

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11. An electron beam column as in claim 8 wherein the accelerating region comprises:

an alignment deflector;

accelerator plates situated below the alignment deflector; and

5 a shield electrode situated below the accelerator plates.

12. An electron beam column as in claim 8 wherein the deflectors comprise:

a mainfield deflector; and

a subfield deflector situated below the mainfield deflector.

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13. An electron beam column as in claim 8 wherein the voltage contrast plate has openings which are beveled at an angle so as to produce an electric field free region in the vicinity of the opening.

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